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990. NICOTIANA INGULBA

Solanaceae

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Illustrations by Deborah Lambkin

Summary. *Nicotiana ingulba* is returned to species level here. It is illustrated from plants cultivated at the Royal Botanic Gardens, Kew, which were grown from seeds collected in the Uluru-Kata Tjuta National Park in the Northern Territory, Australia. Its taxonomic history, ecology, cytology, etymology and cultivation are discussed.

One of the most notable and common species in the Red Centre of Australia has long been known as *Nicotiana rosulata* subspecies *ingulba* (J. M. Black) P. Horton (Horton, 1981), but it is here treated as a distinct species, as originally described by Black (1933; Plate 990). In years when winter weather has provided sufficient rains, the red desert sands are covered in the large-leaved rosettes topped with metre-tall inflorescences covered in white flowers (Fig. 1). These just open when the sun sets, and the combination of the orange-red glow of the sand, the pink sunset sky, the fresh green leaves and fragrant white flowers is unforgettable.

The name *ingulba* is taken from the Aranda word for bush tobacco, which is chewed as a stimulant, a name also used for *Nicotiana gosseii* Domin (Cleland & Johnston, 1933). However, *Nicotiana ingulba* is now considered inferior to *N. gosseii* for purposes of chewing, as stated to us by members of the indigenous community at Uluru-Kata Tjuta National Park during our visit there in 2016. *N. ingulba* is a handsome species, typically forming a rosette of bright green glabrous leaves and several tall inflorescences (up to more than 1.5 m) with minimal radical leaves and bearing striking, large, bright white, scented flowers.

Throughout the Red Centre, it is abundant when there have been winter rains. When we travelled west from Kata Tjuta to Kaltukatjara in August 2016, the red sand along the road was lined with great masses of white from these flowers. It



Fig. 1. *Nicotiana ingulba* (foreground) in the Red Centre, Northern Territory, Australia. Note: in the background is Uluru. Photograph: Maarten Christenhusz.

also occurs commonly in and around the airport that serves Uluru, Yulara (Northern Territory), which has daily flights, so it often welcomes tourists coming to admire Uluru in the spring. It has a wide range, extending across the Gibson and



Plate 990 *Nicotiana ingulba*

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Little Sandy Deserts as far west as Karijini National Park in Western Australia, making it one of the most widespread species in *N.* sect. *Suaveolentes*, but outside the Red Centre it is rarely so abundant.

Originally described as a species by Black, Horton (1981) reduced it to a subspecies of *N. rosulata* Domin in her treatment of *Nicotiana* in Australia, stating that it was merely one end of a continuum in floral features (see Notes). Vegetatively, these two entities are similar except for their sizes (*N. rosulata* is smaller in stature, flower and leaf size (Chase & Christenhusz, 2021b)). In phylogenetic analyses (Chase *et al.*, 2021), *N. ingulba* is the sister species to the entire *rosulata* clade (including *Nicotiana rotundifolia* Lindl., *N. rosulata* and several undescribed species), not just *N. rosulata*, so recognition of it as a species is appropriate.

NOTES. Horton (1981) considered *N. rosulata* and *N. ingulba* to comprise a cline, with larger flowered forms to the north-east of its range in the Northern Territory, where the type of *N. ingulba* was found, and smaller forms to the southwest in Western Australia, where the type of *N. rosulata* was collected. Circumscription of *N. ingulba* is relatively simple: a large plant with basal rosette of mostly glabrous leaves and flowers with the floral tube longer than 2.5 cm (mostly longer than 3.0 cm long). Conversely, circumscription of *N. rosulata* has been highly problematic, but thanks to genetic studies (Chase *et al.*, 2021) we have now clarified this situation (Chase & Christenhusz, 2021b): it is similarly a rosette-forming, nearly glabrous plant with multiple leafless, glabrous stems per rosette, but it is smaller overall than *N. ingulba* and bears flowers shorter than 1.2 cm. However, although this distinction based principally on sizes of parts is simple and easily understood, the morphological gap between these two is filled, as Horton (1981) argued, but not by members of these two species. The intermediate range in flower size is occupied by a third species, sister to *N. ingulba* (Chase *et al.*, 2021), which is described here as *N. pila* M. W. Chase & Christenh. (Chase & Christenhusz, 2021a), meaning ‘flat country’, a word of the Pintupi people describing the prevailing geography of the area. The Pila Nature Reserve is now also the name given to what

was known as the Gibson Desert Nature Reserve until 2020 (<https://www.sbs.com.au/nitv/article/2020/10/30/gibson-desert-nature-reserve-set-be-renamed-and-managed-traditional-owners>). This species also forms rosettes with (nearly) leafless scapes and has floral tubes 1.8–2.3 cm long, but the plants are consistently hairier than both *N. ingulba* and *N. rosulata*.

In 2018, we tried removing seeds from herbarium specimens to augment our own field-collected material, and we have found that it is possible to retrieve viable seeds from specimens originally collected up to 50 years ago. Viable seeds are often present on specimens collected within the past 20 years. Curators at AD, BRI, CANB, NSW, NT and PERTH kindly permitted us to sample seeds from their collections. Several of the collections cited below produced viable seeds. We have made vouchers from the material grown and studied in this manner, and these are deposited at K.

CULTIVATION. *Nicotiana ingulba* makes an attractive horticultural subject. It germinates readily when treated with an aqueous gibberellic acid solution (1 mg/ml) prior to sowing. It will germinate without gibberellic acid, but it then has a much lower germination rate. It is likely a combination of sufficient rain and a lower temperature initiate germination in this species, but further study on this is still required. Seeds are sown on the surface on a nutrient-rich, well-aerated medium (a mix of compost and sand) and kept moist but not wet throughout the growing season. The plants are annuals and should be maintained under bright light and temperatures around 20–25°C. Numerous seeds are produced over the season. In nature, seeds appear to persist for long periods in the soil and they only germinate when there have been winter rains. Flowers are self-compatible and regularly self-pollinate, producing copious fruits and seeds.

Nicotiana ingulba J.M.Black, *Transaction and Proceedings of the Royal Society of South Australia* 57: 156 (1933). Type: AUSTRALIA. Northern Territory, Harper's Spring, *Kramer s.n.* (holotype AD 97219317!). (Fig. 2.)

Nicotiana rosulata Domin subspecies *ingulba* (J.M.Black) P.Horton, *Journal of the Adelaide Botanical Garden* 3: 33 (1981)

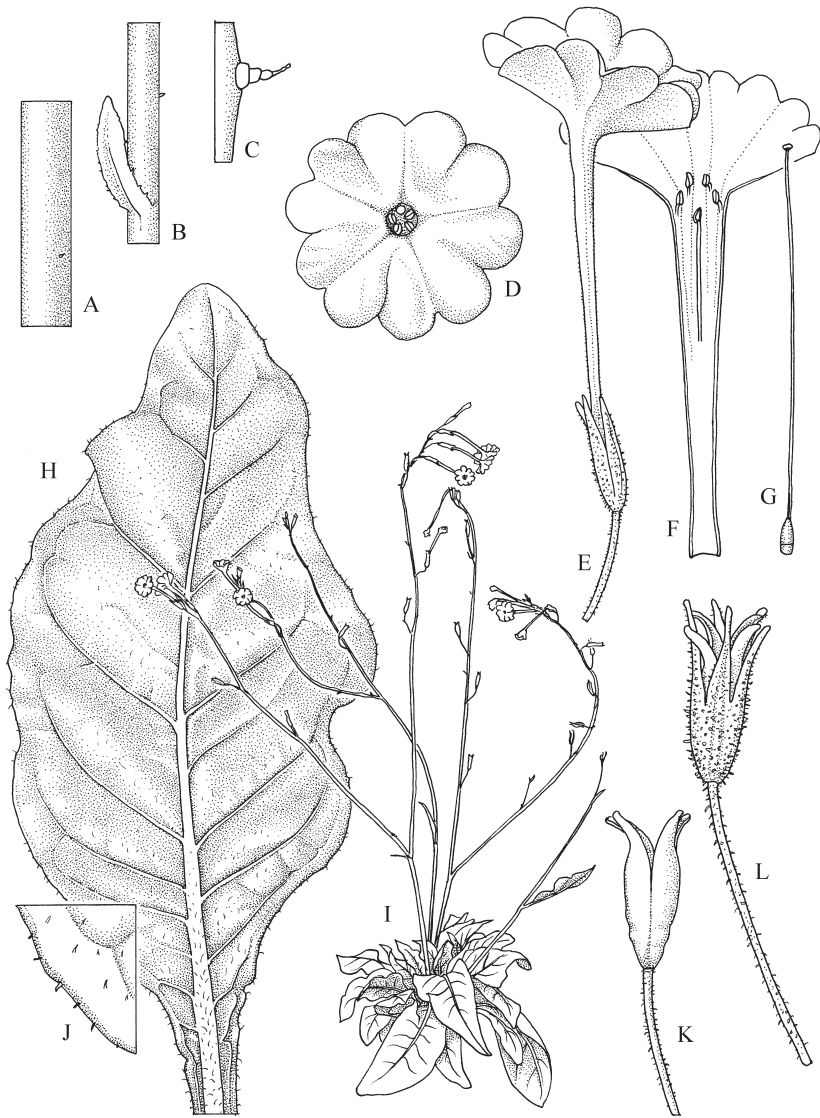


Fig. 2. *Nicotiana ingulba*. A, lower stem, $\times 3$; B, upper stem $\times 3$; C, hair, $\times 9$; D, corolla, face view, $\times 1\frac{1}{2}$; E, flower, $\times 1\frac{1}{2}$; F, corolla, opened out, $\times 1\frac{1}{2}$; G, style and ovary, $\times 1\frac{1}{2}$; H, leaf, $\times 1$; I, habit, $\times \frac{1}{2}$; J, leaf edge, $\times 3$; K, fruit, calyx removed, $\times 2\frac{1}{4}$; L, fruit, with calyx, $\times 2\frac{1}{4}$. Drawn by Deborah Lambkin from specimens cultivated at Kew.

DESCRIPTION. Erect, herbaceous, annual to short-lived perennial *herbs*, forming a rosette, often with some leaves in the basal portion of the stems, producing several strong stems simultaneously, forming a multi-stemmed plant. *Leaves* in a rosette and often also on the lower half of the stems, petioles wingless, up to ca. 10 cm long, the blades 7.4–12.5 × 15.2–27.4 cm, ovate-lanceolate, widest near the middle, gently attenuate, the apex obtuse or acute in the basal leaves to acuminate in those higher up along the stems, margins entire, undulating, with a few multicellular, non-glandular hairs. *Vestiture* of the leaf bases composed of a few long, non-glandular hairs that are often retrorse and slightly twisted, stems glabrous, except at the pedicels and peduncles, with a few multicellular hairs with a globular base and 3–5 short, stacked cells, bracts, peduncles, pedicels and calyx with a few of these same multicellular hairs plus short, slender glandular hairs and short spikey hairs with a swollen, flattened base. *Inflorescence* bracts sessile, linear, c. 0.5–1.3 cm long, the apex acuminate. *Calyx* 1.5–1.9 × 0.20–0.25 cm, one lobe slightly longer and one shorter, the tips acuminate, slightly flaring, 0.4–0.6 cm longer than the fruit. *Corolla* tube 2.8–4.0 cm long (from end of the calyx), 0.20–0.25 in diameter, with no throat cup (*sensu* Horton, 1981), the limb 2.8–3.5 cm across, the lobes cleft, sometimes with a small mucro, 1.2–1.7 cm long; upper four anthers didynamous, attached on short filaments near the mouth of the floral tube, fifth anther positioned about 0.2 cm deeper in the tube with a 1.0 cm long filament. *Fruit* a dry capsule splitting in four lobes, surrounded by the persistent calyx with flaring tips, which is longer at maturity. Chromosome number: $n = 20$ (Tatemichi, 1990; Chase *et al.*, 2021).

DISTRIBUTION. Australia: from westernmost Queensland (Ethabuka) through the Northern Territory (north to Barrow Creek) and northwestern South Australia (Mann Ranges) to central Western Australia (east Pilbara).

HABITAT AND ECOLOGY. In open to slightly shaded sites under mulga (*Acacia aneura* F. Muell. ex Benth.) or other wattle species, 120–700 m, often growing in full sun. These plants germinate in the Australian winter and flower in the spring, dying back to the seed bank in the soil until the appropriate conditions again develop. If in a suitable site, plants can survive the dry/hot summer and re-flower the following season. Rainfall over its large range varies from 200–400 mm per year. In the northernmost portion of its range, the summers are typically dominated by monsoons, but this species appears to germinate principally in the years when there are winter rains, meaning that it is not present in years when it only rains during the summer monsoon season. The monsoon reaches the more southern parts of its range less often, and it is generally drier here and more often there is rain in the winter months.

PHENOLOGY. Flowering and fruiting from August to October in years when there is winter rain (between June and August).

ETYMOLOGY. Black (1933) reported that it was called *ingoolba* or sandhill pitcherie by the Arrernte (Aranda) people of the central part of the Northern Territory. *Pitcherie*, *bedgery*, *pedgery* and *pituri*, among many variants, are all names applied to the wild tobaccos that are chewed by the indigenous peoples. The name *mingkulpa* is used only for *N. gossei* at Uluru by the Anangu people (pers. comm.). It is clear that *N. ingulba* was commonly chewed in the past, and the local words seem to have been applied to both this species and *N. gossei*.

ADDITIONAL SPECIMENS STUDIED. Northern Territory. Stuart Highway (A87) at Taylor Creek crossing, heavily grazed (cows) area along creek, but above flood zone, mostly seedlings, but two flowering plants present, glabrous at flowering, long tubes, very common, 400 m, 21°14'36''S, 134°7'6''E, 1 August 2016, *Chase & Christenhusz 16014* (K, NT, CANB); Maryvale Road (Old South Road), side of road by Evaninga Rock Carvings entrance, red sand dunes, abundant (100–200 plants), long tubes, large plants with stem leaves, branching extensively, 515 m, 24°0'47''S, 133°57'19''E, 5 August 2016, *Chase & Christenhusz 16045* (K, NT, CANB); NT, Watarrka National Park, Stoke's Creek/Gorge, along Creek, abundant, 1000s of plants, long tubes, 635 m, 24°, 21'33''S, 131°45'22''E, 10 August 2016, *Chase & Christenhusz 16080* (K, NT, CANB); Tjukaruru Hwy (Dockar River Road), roadside in red sand, common, glabrous, long tube, 650 m, 25°4'12''S, 129°35'42''E, 13 August 2016, *Chase & Christenhusz 16099* (K, NT, CANB); Gardiner Range; South Tobermorey Station, erect soft herb, creamy white flowers, rare, red sand, small watercourse, sandstone ridge, 23°35'56''S, 137°54'53''E, 25 October 2001, *Latz 18227* (NT A0107070), cultivated at K from seed removed from this specimen, August 14, 2019, *Chase & Christenhusz 18064* (K). Queensland. 8 km NW of Ethabuka Hmsd, erect herb, rare, recently burnt *Triodia basedowii-Eucalyptus pachyphylla* community, sandy rise, dune swale, 120 m, 23°45'6''S, 138°24'52''E, October 13, 2005, *Latz 21389* (NT A0110132), cultivated at K from seed removed from this specimen, 12 June 2019, *Chase & Christenhusz 18059* (K). Western Australia. un-named track c. 2 km north of Spearhole Creek, c. 65 km due west of Newman, on lateritic plain, herb with basal rosette, inflorescences axes often purplish, corolla limb cream, tube purplish tinged, 700 m, 23°21'6''S, 119°6'35''E, 4 September 2004, *Albrecht 11373* (PERTH 8371202), cultivated at K from seed removed from this specimen, September 3, 2019, *Chase & Christenhusz 18112* (K); Joyners Find Greenstone Belt, survey site WILU36, on Lake Way Station approximately 3.5 km west south-west of Linden Bore and 5.2 km north of Coon Well, approximately 33.4 km south-west of Wiluna, east-facing, moderately inclined middle to upper hillslope with fragments of banded ironstone and chert, very rocky weathered haematite and weathered chert/shale strata outcrop with shallow red-orange brown sandy clay loam soils, herb to 20 cm, in fruit, 610 m, 26°47'20''S, 119°57'24''E, August 20, 2006, *Markey & Dillon 4271* (PERTH 7827970), cultivated at K from seed removed from this specimen, 30

October 2019, *Chase & Christenhusz 18137* (K); Karijini National Park, Weano Road, single large plant along disturbed roadside, ca. 180 cm tall, many large stem-leaves, flowers white with a ca 6 cm long floral tube, sparsely hairy along veins and inflorescence, 700 m, 22°27'43''S, 118°11'35''E, August 12, 2015, *Chase & Christenhusz 68189* (PERTH).

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